This document is not an ASTM standard and is intended only to provide the user of an ASTM standard an indication of what changes have been made to the previous version. Because it may not be technically possible to adequately depict all changes accurately, ASTM recommends that users consult prior editions as appropriate. In all cases only the current version of the standard as published by ASTM is to be considered the official document.



Designation:B174–02 (Reapproved 2007)^{ε1} Designation: B174 – 10

Standard Specification for Bunch-Stranded Copper Conductors for Electrical Conductors¹

This standard is issued under the fixed designation B174; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the Department of Defense.

e¹Note—Table1 was editorially corrected in March 2007.

1. Scope

1.1 This specification covers bare bunch-stranded conductors made from round copper wires, either uncoated or coated with tin, lead, or lead-alloy for use as electrical conductors (Explanatory Note 1 and Explanatory Note 2).

1.2 Coated wires shall include only those wires with finished diameters and densities substantially equal to the respective diameters and densities of uncoated wires.

1.3 The values stated in <u>inch-pound either SI units</u> or <u>SIinch-pound</u> units are to be regarded separately as standard. <u>Each The</u> <u>values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other.</u> Combining values form from the two systems may result in non-conformance with the specification. Forstandard.

<u>1.3.1 For</u> conductor sizes designated by AWG or kcmil, the requirements in SI units have been numerically converted from corresponding values, stated or derived, in inch-pound units. For conductor sizes designated by SI units only, the requirements are stated or derived in SI units.

2. Referenced Documents

iTeh Standards

2.1 The following documents of the issue in effect at the time of reference form a part of this specification to the extent referenced herein:

2.2 ASTM Standards:²

B3 Specification for Soft or Annealed Copper Wire 1 ent Preview

B33 Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes

B172 Specification for Rope-Lay-Stranded Copper Conductors Having Bunch-Stranded Members, for Electrical Conductors B189 Specification for Lead-Coated and Lead-Alloy-Coated Soft Copper Wire for Electrical Purposes

B193 Test Method for Resistivity of Electrical Conductor Materials

B263 Test Method for Determination of Cross-Sectional Area of Stranded Conductors

B354 Terminology Relating to Uninsulated Metallic Electrical Conductors

2.3 American National Standard:

ANSI C42.35 Definitions of Electrical Terms³

3. Classification

3.1 For the purpose of this specification bunch-stranded conductors are classified as shown in Table 1 Tables 1 and 2.

4. Ordering Information

- 4.1 Orders for material under this specification shall include the following information:
- 4.1.1 Quantity of each size and class,
- 4.1.2 Conductor size: circular-mil area or AWG (see 7.1),

¹ This specification is under the jurisdiction of ASTM Committee B01 on Electrical Conductors and is the direct responsibility of Subcommittee B01.04 on Conductors of Copper and Copper Alloys.

Current edition approved March 15, 2007. Published April 2007. Originally approved in 1941. Last previous edition approved in 2002 as B174-02. DOI: 10.1520/B0174-02R07E01.

Current edition approved April 1, 2010. Published May 2010. Originally approved in 1941. Last previous edition approved in 2002 as B174 - 02 (2007)^{e1}. DOI: 10.1520/B0174-10.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

³ Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.



TABLE 1 A Classification and Construction Requirements of Bunch-Stranded Conductors^A—Class I Bunch Stranded Conductors

A	rea of		Size,	Glassification	n Size and				Uncoated	Copper	Coated Copper
	s Section		AWG	Minimum	., e.20, and					00000	
				Number							
				of Wires							
		Area	a of		Classification	<u>,Cland</u>			-	Uncoated	d CopperCoated Copper
		Cross S	Section		Size,	Minimum					
					AWG	Number					
	.			- · ·	.	of Wires				_	
Size, AWG	Class I			Class J	Class K	Class L	Class M	Class OClass PClass Q			
Size,	Class I	Nominal dc	Maximum do	Nominal dc	Maximum do	Nominal dc	Maximum d	c Class Q			
AWG	Nominal	resistance	resistance	resistance	resistance	resistance					
	Wire Diameter	@20C	@20C	@20C	@20C	@20C	@20C				
	0.0201 ln.										
	(0.511 mm)										
	<u>Max</u> in.										
14/11/0	(0.511 mm)										
₩ <u>ire</u> Diameter	No.2 <u>0C</u>										
0.0201C	-	Maximum dc									
0.02010	winominal dc	resistance									
	resistance	@2 <u>0C</u>									
cmil	@20C	mm		24 AWGW	ohm/kft	ohm/kft	ohm/km	ohm/km ohm/kft ohm/kft ohm/kn	ohm/km		
cmil	- mm		24 AWG	ohm/kft	ohm/kft	ohm/km	ohm/km	ohm/kft ohm/kft ohm/kmohm/kn			
20820	10.5	7	52	0.508	0.518	1.67	1.70	0.528 0.539 1.73 1.77	1		
16510	8.37	8	41	0.641	0.654	2.10	2.14	0.666 0.679 2.19 2.23			
13090	6.63	9	33	0.808	0.824	2.65	2.70	0.840 0.857 2.76 2.81			
10380	5.26	10	26	1.02	1.04	3.34	3.41	1.06 1.08 3.48 3.55			

TABLE 1 B Classification and Construction Requirements of Bunch-Stranded Conductors—Class J Bunch Stranded Conductors^A Diamete

						Diamete									
f					en	Uncoated	d Copper	as		Coated	d Copper				
0.01			(0.320 mm												
	No. 28 AM														
			ea of	0.0100 in.		Classification	<u>ı, Costan Sana Sana Sana Sana Sana Sana Sana S</u>		Uncoate	d Copper			Coa	ted Copper	
		Cross	Section	(0.254 mm)of Wire	es	Size,	Wireand								
						No. 28 AWC	Minimum								
Size,	Wire-					Maxin.	Number		Nomiamete	r	Maxire	Nomm)		Maxin.	No. 40
No. 30AWG	Diameter			No. 32 AWG		(0.160 mm)	of Wires		0.0050 in.		Diameter	No. 38 AW	G	(0.079 mn	n)
	0.0080 in.					No. 34 AWG	a or writes		(0.127 mm))	0.0040in.			resistance	е
	(0.203 mm)				Wire				No. 36 AW(a	(0.102 0C	;	Wire	@20C	_
Size,	Class J	Nominal		Maximum	-		Nominal	₩ire		Mano	Maximum	Nominal			Мах
AWG	Nominal	No. 32 AWC	G	dc	Diameter 0.0063C	IMB1/2	dc	D@20C		₩ <u>@20C</u>	dc	No. 38 AW	G	<u></u>	
ht	Wire		Wiredc	No. 34 AWG		Winesterle	resistance	10 bas			resistance	m h 17/	0.00310	[∠] Wire dc	resis
	Diameter		resistance			Wiresistance	No. 36 AW	G	₩@20C		@20C	uif 0179		resistance	resis
	0.0126 ln.		@20C			@20C								@20C	
	(0.320 mm)														
emil	mm			2†8 AWG	ohm/kft	-	ohm/kft	ohm/km		ohm/km	ohm/kft	ohm/kft	ohm/kr	ĥ	ohr
cmil	<u>mm</u>		28 AWG	ohm/kft	ohm/kft	ohm/km	ohm/km	ohm/kft	ohm/kft	ohm/km	ohm/km				
20 820	10.5	-7	52							.54	3				
10380	5.26	<u>10</u> 	<u>65</u> 41	1.02	1.04	3.34	3.41	1.08	1.10	3.54	<u>3</u> .61 5				
16 510	-8.37									.64					
6530	3.31	<u>12</u> 9	41 33	1.62	1.65	5.31	5.42	1.72	1.75	5.64	5.76				
13-090	-6.63		33							.96	9				
<u>4110</u>	2.08	<u>14</u> 10	<u>26</u> 26	2.57	2.62	8.44	<u>8.61</u>	2.73	2.79	8.96	<u>9</u> .14				
10-380	-5.26			65	104	165				.3	14				
2580	1.31	<u>16</u>	<u>16</u>	4.10	4.18	13.5	13.7	4.35	4.44	14.3	<u>14</u> .6				
6 530	3.31	12		41	-65	104				.8	23				
1620	0.821	<u>18</u> 14	10	6.53	6.66	21.4	21.9	6.94	7.07	22.8	<u>23</u> .2 368				
4 110	-2.08			26	-41	-65	104			.1					
1020	0.517	20	<u>7</u>	<u>10.4</u>	10.6	34.0	<u>34.7</u>	11.0	11.2	36.1	<u>36.8</u>				

TABLE 1 C Classification and Construction Requirements of Bunch-Stranded Conductors—Class K Bunch Stranded Conductors⁴

A	Area of CI		Classification, Uncoated Copper						Coated Copper					
Cross Section			Size, and Minimum Number of Wires											
		-2-580	-1.31	16		16	-26	-41	-65	Nominal dc- resistance @20C	Maximum dc- resistance @20C			
<u>Size,</u> AWG	Class K <u>Nominal</u> <u>Wire</u> <u>Diameter</u> 0.0100 In. (0.254 mm)	Nominal dc_ resistance @20C	Maximum dc resistance @20C	Nominal dc_ resistance @20C	Maximum dc resistance @20C 2	Nominal dc resistance @20C	Maximum dc resistance @20C	Nominal dc resistance @20C	Maximum dc resistance @20C					
cmil	mm		30 AWG	ohm/kft	ohm/kft	ohm/km	ohm/km	ohm/kft	ohm/kft	ohm/km	ohm/km			
10380	5.26	10	104	165	-04	3 35	341	1.09	1 12	3 58	3.65			

🎐 B174 – 10

TABLE 2 Classification and Construction Requirements of Bunch-Stranded Conductors—Class L, M, O, P and Q Bunch Stranded
Conductors ^A

Area of Cross Sectio	n		<u>(</u>	Classificatior Size, and	<u>ı,</u>			Uncoated Copper Coated Copper						
			Mi	inimum Num	iber									
	<u>.</u>		<u> </u>	of Wires										
	Size,	Class L	Class M	Class O	Class P	Class Q	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum	Nominal	Maximum
	AWG						<u>dc</u>	dc_ eresistance	dc_ resistance	dc_ resistance	dc_ resistance	<u>dc</u> e resistance	dc_ resistance	dc_ resistance
							@20C	@20C	@20C	@20C	@20C	@20C	@20C	@20C
		Nominal	Nominal	Nominal	Nominal	Nominal		0200	0200	0200	0200	0200		0200
		Wire	Wire	Wire	Wire	Wire								
		Diameter	Diameter	Diameter	Diameter	Diameter								
		0.0080 In.	0.0063 In.	0.0050 In.	0.0040 In.	0.0031 ln.								
	_	<u> </u>) (0.254 mm)										
<u>cmil</u> mm		32 AWG	34 AWG	36 AWG	38 AWG	40 AWG	ohm/kft	ohm/kft	ohm/km	ohm/km	ohm/kft	ohm/kft	ohm/km	ohm/km
<u>10380</u> <u>5.26</u>	<u>10</u> <u>12</u> 14	165	<u></u>	<u></u>	<u></u>	<u></u>	1.02	1.04	3.34	3.41	1.09	<u>1.12</u>	3.58	3.65
<u>6530</u> <u>3.31</u>	<u>12</u>	104	<u></u>	<u></u>	<u></u>	<u></u>	<u>1.62</u> 2.57	1.65	5.31	5.42	1.74	1.77	5.71	5.82
4110 2580 1.31	14	<u>65</u>	104	<u></u>		<u></u>	2.57	2.62	8.43	8.60	2.76	2.82	9.06	9.24
<u>2580</u> <u>1.31</u>	16	<u>104</u> 65 41 26 16	65	$\frac{104}{65}$ 41	165 104 65	<u></u>	4.10	4.18	13.5 21.4	13.7	4.40	2.82 4.49 7.15	14.4	14.7
1620 0.82		26	<u>41</u>	<u>65</u>	104	<u>165</u> 104	6.53	6.66		21.9	7.00	7.15	23.0	23.4
<u>1020</u> 0.517	<u>7 20</u>	16	$ \frac{104}{65} \\ \frac{41}{26} \\ \frac{19}{19} $	<u>41</u>	65	104	10.4	10.6	34.1	34.8	<u>11.1</u>	11.4	36.4	5.82 9.24 14.7 23.4 37.1 59.2
<u>640</u> <u>0.32</u>		 7	<u>19</u>	<u></u>	<u></u>	<u></u>	<u>16.5</u>	<u>16.9</u>	54.1	55.2	<u>17.7</u>	18.1	<u>58.1</u>	<u>59.2</u>
404 0.205		<u>7</u>	<u></u> 7	<u>19</u>	<u></u>	<u></u>	26.2	26.7	86.0	87.7	28.1	28.7	92.2	94.0
<u>253</u> 0.128	<u>3 26</u>	<u></u>	<u>/</u>	<u></u>	<u></u>	<u></u>	<u>41.8</u>	42.6	<u>137</u>	<u>140</u>	44.9	<u>45.8</u>	<u>147</u>	<u>150</u>

The constructions shown in this table are typical of those used in the industry. It is intended that this table preclude other constructions which may be desirable for specific applications. The constructions shown provide for a finished stranded conductor approximately of the area indicated. When specified by the purchaser, the number or sizes of wire may be increased to provide additional area to compensate for draw-down during subsequent processing.

4.1.3 Class (Section 3 and Table 2Table 3),

4.1.4 Whether coated or uncoated; if coated, designate type of coating (see 11.1),

4.1.5 Maximum length of lay (see 6.3),

- 4.1.6 Whether separator is required (see 7.2), /standards.iteh.ai)
- 4.1.7 Package size (see section 15.1),
- 4.1.8 Special package marking, if required (Section 14), and

4.1.9 Place of inspection (Section 13).

5. Joints

5.1 Necessary joints in wires shall be made in accordance with accepted commercial practice.

5.2 Joints shall be so constructed and so disposed throughout the conductor that the diameter or configuration of the completed conductor is not substantially affected, and so that the flexibility of the completed conductor is not adversely affected.

6. Lay

6.1 Conductors of the same size and description furnished on one order shall have the same lay.

6.2 The direction of lay shall be at the option of the manufacturer unless otherwise specified.

TABLE-2_3 Maximum Length of Lay for Bunch-Stranded
Conductors

					-								
	ion of		Maximum Length of Lay										
	ea of Section	Size, AWG	Norr Diarr		С	olumn A	Column B						
cmil	cmil mm		in.	mm	in.	mm	in. mm						
20 820	10.5	7	0.167	4.24	3.00	76.20	3.00 76.20						
16 510	8.37	8	0.149	3.78	2.75	69.85	2.75 69.85						
13 090	6.63	9	0.133	3.38	2.50	63.50	2.50 63.50						
10 380	5.26	10	0.118	3.00	2.50	63.50	2.50 63.50						
6 530	3.31	12	0.093	2.36	2.00	50.80	2.00 50.80						
4 110	2.08	14	0.074	1.88	2.00	50.80	1.75 44.45						
2 580	1.31	16	0.059	1.50	2.00	50.80	1.50 38.10						
1 620	0.821	18	0.047	1.19	2.00	50.80	1.25 31.75						
1 020	0.517	20	0.037	0.94	2.00	50.80	1.00 25.40						
640	0.324	22	0.030	0.76	1.30	33.02	0.80 20.32						
404	0.205	24	0.024	0.61	1.20	30.48	0.70 17.78						
253	0.128	26	0.019	0.48	1.00	25.40	0.60 15.24						
159	0.0806	28	0.015	0.38	1.00	25.40	0.50 12.70						